

EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Application of: Directive 2014/90/EU of 23 July 2014 on marine equipment (MED), issued as "Forskrift om Skipsutstyr" by the Norwegian Maritime Authority. This Certificate is issued by DNV GL AS under the authority of the Government of Norway.

This is to certify:

That the Equivalent fixed gas fire extinguishing systems components (extinguishing medium, head valves and nozzles) for machinery spaces and cargo pump rooms

with type designation(s)
NAF S 227 Fire Extinguishing System

Issued to
SAFETY HI-TECH SRL
Formello RM, Italy

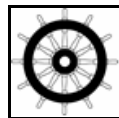
is found to comply with the requirements in the following Regulations/Standards:
Regulation **(EU) 2017/306,**
item No. MED/3.45. SOLAS 74 as amended Regulation II-2/10 & X/3, IMO MSC/Circ. 848,
IMO MSC.1/Circ.1313, IMO MSC.1/Circ.1316, FSS Code 5 and 2000 HSC Code 7

Further details of the equipment and conditions for certification are given overleaf.

This Certificate is valid until **2022-11-27.**

Issued at **Høvik** on **2017-11-28**

DNV GL local station:
Naples



for **DNV GL AS**

Approval Engineer:
Synnøve Eri

Notified Body
No.: **0575**

Vidar Dolonen
Head of Notified Body



The mark of conformity may only be affixed to the above type approved equipment and a Manufacturer's Declaration of Conformity issued when the production-surveillance module (D, E or F) of Annex B of the MED is fully complied with and controlled by a written inspection agreement with a Notified Body. The product liability rests with the manufacturer or his representative in accordance with Directive 2014/90/EU.

This certificate is valid for equipment, which is conform to the approved type. The manufacturer shall inform DNV GL AS of any changes to the approved equipment. This certificate remains valid unless suspended, withdrawn, recalled or cancelled.

Should the specified regulations or standards be amended during the validity of this certificate, the product is to be re-approved before being placed on board a vessel to which the amended regulations or standards apply.



Product description

"NAF S 227 Fire Extinguishing System",

Is a fixed gas fire extinguishing system using fire extinguishing agent NAF S 227 stored in cylinders with Nitrogen as propellant for distribution through pipes and nozzles.

The extinguishing concentration and nozzles are covered by this type examination certificate. Documentation for the other system components shall be submitted and approved for each project. The system is to be designed in accordance with IMO MSC/Circ. 848 as amended by IMO MSC.1/Circ. 1267.

The gas and nozzles are to be produced by Safety Hi-Tech SRL.

NAF S 227 Physical properties

| | |
|---|---|
| Commercial name | NAF S 227® |
| Composition | 99.8 wt-% HFC-227ea (CF ₃ CHFCF ₃) 0.1-0.2 wt-% D-Limonene (C ₁₀ H ₁₆) |
| Agent vapor specific volume (S) at 20°C ¹⁾ | 0.1373 m ³ /kg |
| Design concentration (C) | 8.7 % |
| Min. agent required (W/V) ²⁾ | 0.696 kg/m ³ |
| NOAEL ³⁾ | 9.0 % |
| LOAEL ³⁾ | 10.5 % |
| GWP ⁴⁾ | 3300 |

- 1) To be applied in conjunction with IMO MSC/Circ. 848, 3.4.2.3.1. Ambient temperature to be determined case by case for each project.
- 2) When calculated at 20°C. Ambient temperature to be determined case by case for each project.
- 3) NFPA 2001 (2008 edition)
- 4) Global Warming Potential; 100-year time horizon, CO₂ warming equivalent

Application/Limitation

The design concentration (based on diesel fuel) shall be minimum 8.7 % applied on the net volume of the protected space. Maximum agent discharge time is 10 seconds.

The system shall be designed and installed according to SOLAS Ch. II-2, IMO MSC/Circ.848 as amended by IMO MSC.1/Circ. 1267 and the technical information from Safety Hi-Tech (see Type Examination documentation on page 3).

The following additional limitations will apply:

- A. NAF S 227 is approved for use in engine rooms, cargo pump rooms (hydrocarbon only) and similar spaces. This certificate does not address use of the system for protection of cargo holds and cargo handling spaces for other cargoes than oil (alcohol, LPG, LNG). This will have to be considered by the applicable Administration on a case by case basis.
- B. Evacuation time and warning procedures as per IMO MSC.1/Circ. 1267, 6 should be considered for each project. In no case should the design concentration exceed LOAEL (calculated at net volume and minimum expected ambient temperature).
- C. Steel storage cylinders are of sizes 5 - 240 L. Cylinders being 81 litre or larger is only accepted when arrangements are provided on board to ensure that cylinders can be easily moved (even to shore) for service and recharging.
- D. Gas cylinders shall be delivered on board with a product certificate of the Society or with a certificate issued by a recognized certification authority according to national regulations based on the requirements of the design standard and marked accordingly n, UN or DOT.
- E. Cylinders are topped up with Nitrogen up 42 bar at 21 °C. The fill density shall be maximum 1.15 kg/l. Cylinders shall be delivered with Class certificate, or equivalent certificate acceptable to the flag administration and class in question.

- F. Cylinders are to be located in a separate room in accordance with SOLAS Ch. II-2 Reg.10.4.3, or distributed throughout the protected space in accordance with the requirements in IMO MSC/Circ.848 as amended by IMO MSC.1/Circ. 1267 item 11 and the technical information from Safety Hi-Tech (see Type Examination documentation on page 3). When distributed within the protected space, the minimum extinguishing concentration (after any single failure) shall be taken as 6.7%.
- G. Components in the system shall be of pressure class I with a maximum design pressure of 52 bar (at 55°C). Consideration will though be made for piping and couplings inside the protected space.
- H. The nozzles are to be located in accordance with the Safety Hi-Tech manual. A basic rule is that the nozzle spacing is not to exceed 5 m x 10 m for a 360° nozzle (coverage area 50 m²). The maximum nozzle vertical spacing is not to be greater than 5 metres. The average minimum pressure at each nozzle shall not be less than 7.5 bar.
- I. Bilges (except open bilges in small volume engine rooms) are to be protected with a dedicated nozzle network.

The following documentation is to be submitted to the flag administration in each case:

1. Plans showing location of cylinders, piping, nozzles and release stations as well as the assembled system;
2. Capacity calculations, including hydraulic flow calculations;
3. Plans defining release lines and alarm system;
4. Material specification and dimensions for piping and specifications for all other components.
5. Ship specific release procedures and post discharge ventilation procedures;
6. Manual containing design, inspection, operation and maintenance procedures;
7. Control arrangements for closure of openings and stop of fans and any pressure relief devices as per IMO MSC/Circ. 848, 13. These plans can also be supplied by yard.

Testing at installations and periodical surveys

- The system shall be tested as per maker's manual both at installations and at periodical surveys, except that DNV GL do not require monthly content check of cylinders. The test pressure is minimum 63 bar for any closed sections, whereas open section shall be tightness tested at minimum 7 bar;
- The system is subject to biennial (every 2nd year) inspections by an approved service supplier. The attending surveyor will also apply requirement relevant for flag administration and / or class on newbuilding and ship in operation surveys.

Type Examination documentation

Test report No. VTT-S-1550-09 dated 05 March 2009 from VTT Technical Research Centre of Finland.

Installation, Maintenance and User Manual for NAF S 227® Fire Extinguishing Systems, doc. SHIM125227 Rev. 05 September 2017.

NAF S 227® Engineered Systems Design Manual for Marine Uses, doc. SHDM227 Rev. 05 November 2017.

Tests carried out

Tested according to IMO MSC/Circ. 848 as amended by IMO MSC.1/Circ. 1267.

Marking of product

Main components in the system are to be marked with name of manufacturer and address, type designation and Mark of Conformity (see first page)